

Invasive: Nature in the Anthropocene

by
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φύσις κρύπτεσθαι φιλεῖ (Nature loves to hide)

-Heraclitus

*Heaven and Earth are everlasting
The reason Heaven and Earth can last forever
Is that they do not exist for themselves
Thus they can last forever.*

- Laozi, *Dao De Jing* Chapter 7

The topic of invasive species is a pressing one in our era of climate change and documented mass extinctions at the global level. According to the most popular narratives propagated in the media and scientific literature, the number and diversity of species are diminishing at an alarming rate: the result of the neglect if not outright destruction of our environment. In this process, foreign plants, animals, and bacteria are blamed for harming large sections of native wildlife as well as economic and conservation endeavors. Both government agencies and radical environmental activists alike are concerned with the supposed health of particular ecosystems, as well as the fight to preserve “pristine” and “untouched” landscapes from the harm that techno-industrial civilization inflicts on them.

The purpose of this paper is to assess these attitudes in the face of recent literature on the topic. It is my contention that invasive species are more an indicator of a crisis in a particular environment and not the cause. The main culprit in most cases in the phenomenon of species invasion is human intervention and the destruction of habitat. Indeed, some writers would consider invasives to be a sort of bandage that nature puts over one of its wounds to heal various ecosystems and prepare the way for life to continue after environmental disruption. It is my contention that invasive species represent the failure of humanity to control its own environment, a failure that will only get worse as climate change and environmental degradation continue to change life on Earth as we know it.

The Official Story

The U.S. Environmental Protection Agency defines invasive species in the following passage:

“Invasive species means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species are one of the largest threats to our terrestrial, coastal and freshwater ecosystems, as well as being a major global concern.”¹

A book geared toward children, *Plants Out of Place* by Courtney Farrell, states the following concerning invasives and their harmful effects on environments:

“Invasive plants compete with native plants in many ways. Some invasive plants create a lot of shade. Without sunlight, certain types of native plants die. A few invasive plants even make toxins in their leaves. The toxins poison the soil so other plants cannot live there. After a while, some native plants completely die out.”²

How to Eradicate Invasive Plants by Teri Dunn Chace is a book geared toward gardeners in particular and states the following concerning the persistence of invasive plants in urban and suburban gardens:

“You may have heard the famous Ralph Waldo Emerson quote to the effect that, ‘a weed is a plant whose virtues have not yet been discovered.’ A pretty thought, Ralph, but you did not get out in the mud and pastures much, or live in the times in which we now live. Some people might argue that a weed is a plant with no virtues”.³

One of the key contemporary figures in the biology of invasives is Dr. Daniel Simberloff, the Gore Hunger Professor of Environmental Science at the University of Tennessee in Knoxville, TN. His most recent book for the consumption of policy makers and laymen is entitled, *Invasive Species: What Everyone Needs to Know*, published by Oxford University Press in 2013. In this work, Simberloff seeks to give a broad overview concerning important elements of invasive biology and particularly its effects on human society and development. Simberloff is a major exponent of the “orthodox” biological view that invasive species have an overall negative impact on humans and nature, and he goes over the history of control and eradication of these species.

For example, Simberloff states that invasives can alter entire landscapes permanently and for the worse if not dealt with by conscientious human intervention. For example, he writes:

¹ http://water.epa.gov/type/oceb/habitat/invasive_species_index.cfm

² Farrell, 9

³ Chace, 13

“Because so many species are closely tied to particular habitats, impacts that greatly change the habitat can ripple through an entire community. For example, in the 18th and 19th centuries, the northeastern North American coast was composed of extensive mud flats and salt marshes. Nowadays, it is usually characterized by rocky beaches. This dramatic change is all due to the European common periwinkle snail... introduced (probably for food) to Nova Scotia around 1840. It slowly spread southward, eating algae on rocks and also root stocks of marsh grasses and transforming vegetated coasts into barren rocky shores. Thus, the periwinkle has modified the entire physical structure of the intertidal zone, and in the process has affected many other species. It displaces native snails, and prevents barnacle larvae and young seaweeds from settling, and marshland birds move away.”⁴

This is not the only case of an invasive species drastically altering a regional environment. Charles Mann, in his book, *1493: Uncovering the World Columbus Created*, documents many cases of invasive species affecting various environments through what modern historians call “the Columbian exchange”. For example, the northeastern forests of the United States had neither earthworms nor honey bees prior to the arrival of the Europeans. Thus, forest floors piled up thick with leaves and other debris. These forests were drastically altered with the arrival of earthworms in European agricultural plants that ate these layers of debris, and many species were affected by this drastic change of environment.⁵

More commonly, however, invasive species are blamed for competing for resources with or outright eating native species that they encounter upon “invasion”. Perhaps one of the worst culprits is the brown tree snake that came to the island of Guam from Australia in U.S. Armed Forces planes around 1950. They have since decimated the local bird population due to having no natural predators.⁶ Similarly on island environments in particular, such creatures as European house cats, rabbits, and feral pigs can devastate animal and plant populations due to their taking advantage of novel conditions where they are considered neither prey nor predator by native species.⁷ This does not include invasive plants, such as Japanese kudzu, the plant that “ate the [U.S.] South”, which can crowd out native vegetation and alter the appearance of entire landscapes.⁸ “Many species today,” Simberloff states, “on continents as well as islands, are dwindling toward extinction, even if the final death throws will be centuries from now. The decline of a substantial fraction of those is due wholly or partly to introduced species.”⁹

⁴ Simberloff, 56

⁵ Mann, 53

⁶ <http://ftp.ma.utexas.edu/users/davis/375/LECTURES/L24/snake3.pdf>

⁷ cf. Simberloff, 192

⁸ <http://science.kqed.org/quest/audio/the-vine-that-ate-the-south-heads-north/>

⁹ Simberloff, 240

Simberloff and other scientists working in invasive biology readily admit that invasive species are almost exclusively the product of human activity. Nevertheless, they advocate for even more human activity, up to and including outright eradication, to eliminate elements of nature that are “out of place,” for the benefit of humans and other native living things. For example, unexpected changes in predator / prey relationships can lead to trophic cascades, introducing further imbalances in an ecosystem that has already been invaded. Simberloff offers the following example of this phenomenon in his book:

“An interesting trophic cascade occurred on subantarctic Macquarie Island, a World Heritage site discovered in 1810. This case demonstrates how indirect effects such as trophic cascades can lead to unintended harmful consequences. Sailors introduced cats to control rats and mice that they had inadvertently introduced and that threatened their food stores. In 1878, sealing gangs introduced rabbits as a local food source. The rabbits thrived and also proved to be a common prey item for the cats. The rabbits caused enormous damage to the vegetation, so the rabbit myxoma virus was introduced in 1968. Rabbit numbers quickly plummeted, and vegetation began to recover. However, the cats then turned to native ground-nesting birds as alternative prey, spurring a cat eradication program initiated in 1985. All cats were eliminated by 2000, but then the rabbit population exploded and again devastated the vegetation. Thus, through a trophic cascade, introduction then elimination of cats led to a decline in vegetation.”¹⁰

Thus, invasive biological orthodoxies dictate that there is an equilibrium within a given ecosystem that existed prior to human intervention. Should this equilibrium be thrown off for some reason, it is the human obligation to try to restore it, either by quarantine of the invasive, introducing predator species to reduce the number of the invader species, or outright eradication by chemical or other means. In spite of the setbacks that may present themselves like the trophic cascade scenario mentioned above, scientists working on invasives usually recommend vigorous intervention as soon as possible to root out these plants or animals before they become too much of a problem. Indeed, even where invasives appear to be relatively harmless or even beneficial, they counsel that the harmful effects of these species will sometimes only manifest themselves decades after initial introduction.¹¹ It is better, so the reasoning goes, to be safe than sorry.

Invasive Biology Revisionism

In the past few years, many scientists and writers have come to question the premises behind this zero-tolerance attitude towards invasives. Dr. Ken Thompson is a Professor in the Department of Animal and Plant Sciences in the University of Sheffield in the United Kingdom and author of the 2014 book, *Where Do Camels Belong? The Story and Science of Invasive Species*. In this

¹⁰ Simberloff, 87

¹¹ Simberloff, 253

book, Thompson like Simberloff endeavors to provide a comprehensive introduction to the topic of invasives, but this time from the view that they are not as harmful as most scientists to this point have stated. Thompson tells the story of Charles Elton, one of the early pioneers in the study of invasive species, and his rather problematic attitudes toward “invaders” that were a product of having lived through the tumultuous war-ridden years of the early 20th century. As Thompson states:

“Elton had lived through two world wars, so ‘invasion’ was a more loaded idea for him than it is for you or me. Indeed, in the Second World War, he worked on controlling rabbits, rats, and mice - ‘alien invaders’ that were eating stored food and farmers’ crops, and were thus practically in league with the Nazis.”¹²

Moreover, Elton firmly believed that nature was a static thing, and the contemporary order of nature was rational just as is:

“Elton believed firmly that species belong to wherever they happen to be right now, irrespective of length of tenure or of where they had evolved or migrated from. More than that, he believed that belonging confers rights of occupancy, that these rights extend indefinitely into the future, and that natives are morally superior to aliens.”¹³

This is all to say that for Elton and many conservation biologists influenced by him, the idea of “invasive species” comes from a political preference for stability as pictured in idealized human societies. Thompson spends much of his book documenting why this static vision is not very realistic.

For example, Thompson discusses the persistence of the much-villainized purple loosestrife in the wetlands of North America, and cites one review article by Canadian ecologist Claude Lavoie stating:

“There is certainly no evidence that purple loosestrife ‘kills wetlands’ or ‘creates biological deserts’, as it is repeatedly reported. For instance, 63 insect genera, representing 38 families and seven orders, have been collected from purple loosestrife invaded sites in Manitoba. There are no published studies (at least in peer-reviewed journals) demonstrating that purple loosestrife has an impact on waterfowl or fishes.”¹⁴

¹² Thompson, 39

¹³ Thompson, 40

¹⁴ Thompson, 56

Nor is this the only invasive with an unmerited bad reputation. Tamarisk is often blamed in the U.S. Southwest for crowding out species and negatively disrupting ecosystems, but such damage is more imagined than observed:

“Tamarisk illustrates another important principle: once an alien invader gets a bad name, it becomes easy to blame it for any perceived environmental problem in the vicinity. The original riparian woodlands were the home of the endangered south-western willow flycatcher, and tamarisk was widely assumed to be one of the reasons for its decline, but it now turns out that in some areas many of the flycatchers nest quite happily in tamarisk, and that fledging success there is indistinguishable from that in native trees. Indeed, concerned over loss of habitat for the flycatcher, the US Fish and Wildlife Service refused permission for the release of tamarisk biocontrol insects in parts of the bird’s range.”¹⁵

Nor is it at all evident that invasive species automatically cause mass extinctions of native species. Thompson cites marine invasives as an example:

“[T]he 80 alien marine species introduced to the North Sea in recent centuries have caused no native extinctions so far, ditto for at least 70 species established in the Baltic, and the massive influx of species into the Mediterranean Sea via the Suez Canal has so far failed to cause more than a tiny number of local extinctions.”¹⁶

Finally, Thompson exhorts readers to give up on the idea of nature as neatly ordered and static. He summarizes his thoughts in the following passage:

“The view of the biosphere you learned in school, disturbed to varying extents by humans, is seriously out of date. The modern world is essentially a mosaic of new ‘anthropogenic biomes’ (croplands, plantations, settlements, cities, rangelands), with here and there natural ecosystems embedded within them. It’s because so much of the world has been transformed so dramatically that there is now a consistent ‘winning’ syndrome. In a world before significant human influence, there was room for everyone, and all available tickets had some chance of winning. It’s only in the last few thousands years, and especially in recent centuries and decades, that being a rat or a weed has turned out to be the golden ticket in life.”¹⁷

For Thompson, the “invasion” of out-of-place species is best tackled by no action at all. Since invasive species often prosper only in environments adversely affected by human behavior, once that particular environment has “healed” itself, the invader often goes away or is severely

¹⁵ Thompson, 72

¹⁶ Thompson, 110

¹⁷ Thompson, 120-121

curtailed by the renewed dominance of native plants.¹⁸ Thus, Thompson suggest the best way to get rid of invasives is just to ignore them.

Environmental reporter Fred Pearce has an even more optimistic view of invasive species in his recently published book, *The New Wild: Why Invasive Species Will Be Nature's Salvation*. This book outlines even more emphatically why invasive species are almost entirely a product of human negligent intervention into the environment, and how often invasive species arrive on the scene to “clean up” the mess that people have made. More importantly, the premise underlying Pearce’s book is that the “fragility” of nature in general and ecosystems in particular is a myth. Most researchers have worked from the premise that various organisms within an ecosystem co-evolve within it, and invasives upset a delicate balance between all of them. Pearce however echoes other scientists who believe that “ecological fitting” is a better explanation for the interactions between organisms in a given environment, citing Green Mountain on Ascension Island in the Atlantic: an environment entirely made up of non-native species that have formed a completely functioning ecosystem in the space of 150 years.¹⁹ Pearce’s idea of nature in this book emphasizes self-organization and versatility rather than stasis and fragility. The appearance of invasives is usually a sign of extreme environmental stress due to human activity, and can also have a “healing effect” depending on the circumstances.

Examples of this phenomenon occur in many water-borne invasives. Lake Victoria in Uganda in the 1990’s was massively invaded by water hyacinth, to the point that it was almost impassible by boat. However, in 1998, due to the heavy rains of an El Nino year pouring fresh water into the lake, the plant began to recede. Scientists realized that the water hyacinth thrived due to the amount of pollution in the lake that had deprived the water of oxygen in its bottom layers; the fresh rain water had “washed” the lake clean. As an Amazonian plant, the polluted environment low in oxygen was ideal for its growth. When such heavy rain ceased, the pollution began to build up in the lake again, and so did the water hyacinth.²⁰

This sequence of events has been repeated in such cases as the infestation of *Caulerpa taxifolia* in the Mediterranean and the zebra mussel in the North American Great Lakes: due to pollution, an invasive organism takes advantage of the polluted environment to become an apparent menace, only to recede again once the environment recovers.²¹ While the organism may still be present, it is no longer able to dominate in the context of a healthy ecosystem. In some cases, if biodiversity is something to prize, invasives may also augment biodiversity, and not diminish it. Pearce argues that for a dominant group of scientists:

¹⁸ Thompson, 157

¹⁹ Pearce, 9

²⁰ Pearce, 33

²¹ Pearce, 45

“...[A]lien species don’t count and are not counted. They do not exist as part of nature. They have no place. They are un-nature, if not anti-nature. They should be gone. Under this definition, biodiversity in the twenty-first century can only go down. Extinction could cut the number of species, but introductions can never increase it. Thus the inconvenient fact that alien species actually increase real biodiversity in many places is simply defined away... It sounded more like ideology than good science.”²²

Indeed, Pearce names names and states that Simberloff and other scientists seek evidence to confirm their bias against invasive species. For example, Pearce breaks down the cases mentioned in Simberloff’s *Invasive Species: What Everyone Need to Know*, showing that Simberloff focuses inordinate attention on “tiny specks” of the planet like isolated islands while devoting few pages to places like Africa where invasives seem to do far less harm.²³ Pearce calls out the philosophical biases of many scientists and policy makers:

“The idea of nature’s balance and how humans were capable of transgressing or destroying it... is implicit in the biblical story of the Garden of Eden, in which sinning humans are cast out from the garden, They were separated from nature and doomed to damage her. The idea has persisted right into the modern world, in which our view of nature is, ostensibly at least, based on science. The balance of nature has become a ‘foundational metaphor of ecology,’ says Stephen Trudgill, a British geographer from Cambridge University who specializes in what he calls our social engagement with nature. Ecology, he says, is science built on ‘the guilt-laden notion that we have disturbed the natural order, and it is now all wrong and our fault.’”²⁴

Thus, the central thrust of Pearce’s idea of a “new wild” is that there was no “natural balance” to upset in the first place. And thus there is not a central cast of characters that is supposed to occupy a certain region or ecosystem, if “ecosystem” is even an appropriate name for a group of organisms living together in a particular area. (Often, people mistake a native organism for a non-native organism based on how much of a nuisance it seems to them, as in the case of the highly problematic sycamore tree in Great Britain.)²⁵ Nature here is dynamic and on the move. If new actors appear, they may at first seem to get the upper hand in some cases, but soon these regions reconstitute themselves, and nature continues what it has been doing for millions of years.

²² Pearce, 70

²³ Pearce, 106-107

²⁴ Pearce, 136

²⁵ Pearce, 79

Some writers take a more holistic approach toward invasives, articulating how these species can have a “healing effect” on the earth and human bodies in the face of severe disruption of ecosystems. One such writer is Timothy Lee Scott, a Chinese medicine practitioner and herbal medicine specialist. In 2010 he came out with a book entitled, *Invasive Plant Medicine: The Ecological Benefits and Healing Abilities of Invasives*. While the primary aim of the book is to provide health care with the plants that are becoming pervasive in our environment, Scott also takes the opportunity to reflect philosophically on the meaning of invasives in a polluted and tainted world. Like one of his mentors, Stephen Harrod Buhner, Scott believes in the agency of plants and not merely their being passive towards the actions of other sentient beings. Scott is openly a proponent of the Gaia hypothesis of James Lovelock and Lynn Margulis in which the Earth is seen as a “living organism of interdependent biosystems that feed one another in order to sustain the whole life of the planet.” In this sense, Scott states that:

“Gaia has been fully self-regulated by all life on earth for hundreds of millions of years, and our unprecedented time in the planet’s history is requiring extreme adjustments of ecosystems.”²⁶

For Scott, the pervasiveness of invasives signals a time of general illness of the planet, including for humans who inhabit it. His main premise is that, just as ecosystems are getting sick and susceptible to invasive organisms, so are our bodies:

“The degradation of the health of the whole as an unintended consequence of futile attacks on invaders is not an isolated phenomenon but instead it is a pattern that repeats on the macrocosmic as well as microcosmic scales. The deteriorating health of our forests is analogous to the current weakening of the human immune system. Widespread chronic disease, antibiotic-resistant bacteria, and emerging, endemic diseases result from modern medical practices just as Gaia’s infected biosystems are caused by modern industrial and agricultural practices. Invasive epidemics are based on the widespread use of toxins and poisons that infect all biosystems, great and small, and these destructive influences trickle down into cellular life, mortally impregnating all Earth’s species with deformative and abortive destiny.”²⁷

In spite of their being a sign of a sick environment, invasives can be not merely part of the problem but also part of the solution. Very often, supposedly ominous invasives can be the “first responders” to scenes of ecological devastation. As Scott writes:

“When my wife and I moved onto this piece of land, it had been recently logged, and a couple of acres had been cleared for a house site. Blackberry colonized this desolate hillside and protected it from further erosion and intrusion. The plant descended on this land like a lion protecting her

²⁶ Scott, 95

²⁷ Scott, 97

cub, showing her thorny fangs with ferociousness. It was angry, protective, reclaiming the wild, and there was no venturing onto this space without bloody repercussions.”²⁸

Scott also explains that invasive plants also serve as filtration systems that take dangerous pollutants out of environments. They can absorb harmful chemicals left by industrial production, much as our kidneys, lungs, and other organs keep toxins out of our bodies. In this instance, Scott comes to the defense of kudzu, the “vine that ate the South”:

“Expansion of infrastructure, abandonment of farmland, and the establishment of plantations of trees for the lumber industry are major contributors to helping move this plant throughout the area. Kudzu is a warrior plant that tries to protect these areas with its viney presence, creating a fencelike barrier to keep out further intrusion. This ability is exemplified by not even allowing battle tanks on a Virginia military base to move through their viney entanglement. Kudzu follows along the trail of petroleum that is left behind by massive fossil fuel-based machinery, and it helps clean this contaminant and other toxins from the environment as it protects it. This steadfast plant essentially counters the agro-military-industrial fossil fuel based encroachments, and in order to do so, has to be a very powerful entity indeed.”²⁹

Although invasives are often blamed for bringing about human illness, as Scott shows throughout the book, they also heal human illnesses that are brought about by the encroachment of civilization. Lyme disease in the U.S. Northeast is often blamed on the incursion of invasive plants, but Scott has alternative explanation for the arrival of Japanese knotweed in Lyme diseases-infested areas:

“Knotweed is now widely used for the treatment of Lyme disease, and according to Stephen Buhner, the plant tends to move to infected areas six months to one year prior to the arrival of the disease. In addition to addressing a variety of invading pathogens with potent antimicrobial tendencies, Japanese knotweed’s abundance of vitamins, minerals, and antioxidants help the body to process numerous toxins and cancers.”³⁰

Thus, one can conclude that invasive species are helpers that come to the aide of ecosystems and our own bodies:

“Invasive plants are the warriors of the landscape, pioneering toxic and infected terrains, where they fight in the battle against pathogenic influences of our ecosystems. Sometimes they engage

²⁸ Scott, 196

²⁹ Scott 237-238

³⁰ Scott, 223

the warrior within us and impart potent messages to our being so that we make use of their medicine.”³¹

Tao Orion, a permaculture designer and writer based in Oregon, has recently published a book based on her own experience with invasives entitled, *Beyond the War on Invasive Species: A Permaculture Approach to Ecosystem Restoration*. In this book, Orion takes a more systematic ecological approach towards invasive species, as well as speculates concerning their wider use in permaculture management endeavors. Orion’s experience comes through working in conservation and witnessing firsthand that attempted chemical eradication with herbicides such as glyphosate does not work in restoring habitats (these species kept coming back to invaded areas), and that another approach must be taken to restore disturbed ecosystems. As she states in one passage:

“If the goal of restoration is to return the site to its ‘original’ state - and this is the stated goal of many restoration projects - then glyphosate-treated soil with artificially limited zinc, iron, calcium, manganese, and magnesium cannot possibly approximate historical soil characteristics... Native species rely on a vast array of functional relationships among soil microorganisms and fungi whose populations are depleted or destroyed by the use of glyphosate-based herbicides, If the goal of ecological restoration is to approximate precontact ecosystem conditions, then herbicides like glyphosate cannot be part of a management strategy.”

³²

Such a realization has made Orion and other conservation practitioners more aware that a holistic and “macroscopic” view of an entire ecosystem is needed to know the role of the invasive within it:

“The organism-centered analysis so prevalent in the literature of invasion ecology leads to organism-centered management, revolving around the eradication of specific species in an attempt to return ecosystems to their former diversity, abundance, and resilience. Although there is little research suggesting this works, eradicating invasive species is considered normal and necessary within the framework of contemporary ecosystem restoration. Although many restoration ecologists know that there are larger ecological processes at work in the context of any invasion, invasion ecology as a discipline remains rooted in the idea that invasive species are the drivers of, rather than passengers on, the seemingly runaway train of ecosystem change. A more holistic approach would look at the dynamic of invaded ecosystems as interdependent with

³¹ Scott, 168

³² Orion, 35

the invading organism rather than focusing on details like whether a particular plant contains more or less vegetative biomass than another plant that lived there before.”³³

Orion then proceeds to offer multiple examples of cases where the reintroduction of a native species is practically impossible due to an altered environment far more favorable to the invasive plant.³⁴ She then describes the role of a niche in a given habitat, that is, the function that a particular species play in providing food, shelter, and other benefits to organisms living around it. One notable example of this is the declining number of beavers throughout North America who shaped the landscape with their dam building which in turn created wetlands and meadows, allowing many other organisms to thrive. Orion notes that the giant reed, an invasive, performs a replacement role in the California landscape:

“In the absence of an animal whose engineering feats increased sediment retention, spread water beyond the channel, and decreased water flow velocity, there is a plant growing that does many of the same things. As Parmenides mentioned nearly two thousand years ago, nature abhors a vacuum. Robust stands of giant reed do preclude the growth of native riparian vegetation. They also don’t provide habitat for the diversity of animals that native species do, but given the alteration of stream structure engendered by the loss of beavers and other related changes in land use and hydrology, there is no indication that native riparian vegetation, including flood-adapted willow and cottonwood, would survive in the altered conditions.”³⁵

Thus, according to Orion, invasive species are neither totally harmful nor totally harmless, and they can get out of hand if not properly managed. But the only effective way to do address them is to take into consideration their role in a given ecosystem, and work with them rather than against them in the process of restoration.

On a related theme, Orion polemicizes against the idea of wilderness, or land untouched by human hands, stating that places that we perceive as “wild” are often really abandoned projects of land management that went on for thousands of years prior to the arrival of Europeans. The prevalence of “food forests” in places like the Amazon and the environments full of medicinal and edible plants noted by various European explorers were neither happy accidents nor the product of untainted nature, as Orion states:

“The plants and animals that are now considered native are not static features of an ecosystem; they are relics of conscientious stewardship, and it is this stewardship that is required if their

³³ Orion, 56

³⁴ e.g. Orion, 71

³⁵ Orion, 135

populations are to be maintained. Many native plants are well adapted to proliferate with the disturbance that harvesting and other cultivation activities provide.”³⁶

Orion’s permaculture approach to the environment is one of “use it or lose it”, The wilderness model, created artificially by the descendants of white settlers in the 19th century, dictated that the only way to respect and save a land was to leave it alone and keep it off limits to all human activity. Orion states that, paradoxically, the only way that we will save a piece of land is if it sustains us and we develop a symbiotic relationship with it.

Orion thus spends the last part of her book presenting various ideas on how to restore environments utilizing invasives and their products to create alternative economic prospects, thus defending habitats by integrating them into human societal endeavors. Orion indicates that the predominant manner by which humans take care of their environment is to employ it wisely in a sustainable way of living. Invasive species in her estimation will help humanity get from our current ecocidal regime to something more harmonious and holistic:

“Restoration in this sense is not so much a process of going back, but of moving forward into the unknown, and using our creativity and the tools available to us to create conditions in which life can thrive... In so doing, we will learn how to best encourage the proliferation of highly diverse and abundant ecosystems and manage invasive species in the process. We will not achieve anything of the sort by continuing to eradicate these novel organisms in the vain hope that the ecosystems where they live will be the same as they were in some idealized time in the past. We are here now, on the cusp of the sixth great planetary extinction, with climate change intensifying, and the ways that we relate to the land that sustains us will become ever more central to designing our way through the challenges to come.”³⁷

Some would state that drastic environmental change has already happened. The distinguished Professor of Biology, Richard B. Primack, wrote a book released in 2014 entitled, *Walden Warming: Climate Change Comes to Thoreau’s Woods*, documenting his years of research studying the change in the environment around Walden Pond in Massachusetts, famous as being the inspiration of 19th century U.S. philosopher Henry David Thoreau. Thoreau, being one of the first environmentally-conscious writers, took meticulous notes concerning the behavior of the flora and fauna in the 19th century, including when certain flowers bloomed, when certain birds returned from migrations to the south, when pond ice melted, etc. What Primack and his fellow researchers found is that the behavior of these plants and animals has slowly but surely changed, as has the landscape of Walden Pond itself:

³⁶ Orion, 161

³⁷ Orion, 179

“We gradually realized that there were a lot of species that Thoreau and later botanists recorded in Concord that we were not seeing. Of the species seen by Thoreau in the mid-nineteenth century, mainly in the 1850’s, we failed to find fully a quarter of them during our first years of searching in 2003, 2004, and 2005 - and no one that we spoke with seemed to be able to tell us where to find them.... And for many other species, the plants were still present in Concord, but in very limited numbers.”³⁸

Primack speculates that many species of plants in particular have disappeared due to the climate becoming warmer earlier in the spring, throwing off native plants and opening up opportunities for such invasives as purple loosestrife and other flowers:

“This result shows clearly that the success of invasive plant species is at least partly due to their ability to adjust their flowering time (and presumably their leafing-out time) in response to a changing climate. This physiological flexibility gives these invasive species a great advantage and allows them to outcompete native species and increase greatly in abundance.”³⁹

The effects of climate change are thus slowly occurring before our eyes, and native species cannot be preserved by conservation efforts alone, if at all:

“The effects of climate change *are already here in Concord, right now*, and are already determining which species are winners and which species are losers. These simple and startling results tell us that global warming - something many of us consider to be a problem of the distant future that will affect our grand-children or even great-grandchildren, - has already begun its advance right in Thoreau’s Concord. Species that can deal with a warming climate will be able to persist and expand in Concord, but species that can’t deal with climate change are declining in abundance and are heading toward local extinction.”⁴⁰ (Emphasis in the original.)

Conclusion

From these diverse conversations concerning invasive species, the most undisputed point is that we are entering in an epoch of great unknowns. One thing that is certain is that the consensus that considered invasives to be a massive threat to ecosystems and biodiversity will require greater nuance and revision as we go forward. Major premises of invasion biology may have been based on questionable ideology and bad science. In a discussion of the lackadaisical manner in which researchers have cited one particular influential paper against invasives, Professor

³⁸ Primack, 39

³⁹ Primack, 80

⁴⁰ Primack, 68

Matthew K. Chew of Arizona State University notices the following in his own 2015 paper, “Ecologists, Environmentalists, Experts, and the Invasion of the ‘Second Greatest Threat’”:

“Lax citation practices are a well-known rattling skeleton in academe’s closet. Categorising and quantifying their occurrence to determine whether ecologists, conservation biologists, or invasion biologists are any more predisposed to citing unread sources based on their reputed content than practitioners in any other discipline would be a monumental undertaking. But the flexibility with which the claim of Wilcove et al. has been deployed is impressive. There are so many extant permutations that it is impractical, even electronically, to inventory them. Many paraphrasers fail to acknowledge that the finding was limited to the United States. Few ever note that it was strongly skewed by the inclusion of Hawaiian cases, and virtually none that it was grounded in anecdotal data.”⁴¹

No matter what our predisposition towards the idea that invasive species are harmful to ecosystems overall, much of the actual data to support the claim ranges from inconclusive to highly dubious. And in particular cases where they seem to be a plague of Biblical proportions, they are often the scapegoat for larger human-driven problems in an ecosystem, such as pollution or the loss of habitat.

The main theoretical lesson that I conclude with is that a proper understanding of invasive species prevents us from falling into two seemingly opposite but related errors. On the one hand, invasives show that, even if there is no “purely natural” apart from human intervention, human agency has not achieved perfect dominance over what would commonly be deemed as “nature”. In spite of modern pretense to the contrary, humanity cannot and perhaps will never totally control nature, and its plans will continue to be frustrated by unruly and undominated life that invades manicured and cultivated spaces. On the other hand, invasive species undermine the idea of “wilderness” and perhaps “wildness” itself, showing that our modern ideas of what “untouched” nature should look like are just as problematic as the Promethean impulse to bring all things under human control. Going forward into an epoch of perhaps extreme environmental change, we will have to navigate between these two extremes. We will continue to rely upon and manipulate the environment as we have always done, but as always we will be checked and even humbled by the great mystery that lies beyond us; a mystery that can cause both destruction and wonder, dearth and plenty, and life and death for particular organisms in the long parade of existence. For successful creatures of the Anthropocene, to paraphrase John Henry Newman, to live is to change, and to survive is to change often.

⁴¹ Chew, 34-35

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